

Scrag Mill Control System

For _____ Forest Products

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1.1 Installation

!WARNING!

Before performing any installation, maintenance or adjustment always lock out & tag out equipment per OSHA & your facility's regulations. The hydraulic, pneumatic, electrical, and other mechanical systems incorporated into this equipment & the equipment in the general area are capable of storing hazardous energy. Before performing any maintenance or adjustment all sources of potential energy must be identified and released or properly secured in order to prevent an unexpected release of energy while servicing or installing. Failure to do so and/or failure to install equipment properly may result in serious injury or death.

- 1.1.1 The operator panel must be mounted securely in a location providing the operator full view of all controlled equipment.
- 1.1.2 Please refer to the electrical schematic and panel layout drawings for connection details.
- 1.1.3 Knockouts for conduit/cord connections should only be made on the bottom of the control panel enclosure & should be of equal or better contaminant protection rating as the panel enclosure in order to preserve the integrity of the enclosure seal. All panels are min. NEMA 12.
- 1.1.4 Do not weld on the equipment with the networks system installed; welding will cause damage to the electronics. Damaging electrical spikes can be transmitted through ground conductors and equipment chassis.

1.2 Description

The scrag mill control consists of the following basic components:

- Control panel
- Hydraulic & pneumatic system
- Set controller

The control panel consists of an electrical enclosure housing the control logic relays, PLC controller, operator interface switches & indicating lights and touch screen interface. The operator will directly control operation from the control panel. The control panel requires input from standard limit switches (by others) for sensing the equipment condition. The control panel receives input from the operator & from sensors located on the equipment. The control system logic interprets the sensor input & executes an appropriate output to the hydraulic & pneumatic system (by others) and/or the indicating lights & display. The hydraulic & pneumatic system provides the power to operate the mechanical systems. Please refer to your electrical schematic for field device connection details.

The hydraulic system consists (by others) of an 2 electric motor driven variable volume pumps, several manifolds with various solenoid operated valves controlling conveyor & other functions, 2 proportional valves controlling the networks, piping, return filters & a reservoir. The pneumatic system (by others) is similarly comprised of various manifolds and valves controlling material handling functions, supply air is provided by the plant. Please refer to your hydraulic & pneumatic system documentation for specific details concerning your hydraulic & pneumatic system.

The set controller is a computer system that automatically positions the bandmills at any position input from the operator's panel. This system is comprised of the proportional hydraulic valves driving the networks cylinders, the position feedback encoders mounted on each slideway, the set controllers mounted in the networks controller box, and position command and display functions provided by the PLC controller. The PLC control logically determines by means of operator input and position feedback from the set controllers what the next set position should be and sends a command signal to the set controller. The set controller interprets the command signal from the PLC and operates the proportional valve appropriately to move the bandmill to the desired position. The set controller constantly checks the current position by reading the sensor input and comparing it with the desired position. Any deviation from the desired position by factors such as valve leakage, backdriving loads applied to the bandmill, etc. is counteracted by the set controller, thus actively maintaining the set position between sets.

1.3 Operation

!WARNING!

The hydraulic, pneumatic, electrical, and other mechanical systems incorporated into this equipment & the equipment in the general area are capable of storing and releasing hazardous energy capable of causing serious injury or death. This equipment operates automatically, **NO PERSONNEL SHOULD EVER BE ALLOWED TO ACCESS ANY HAZARD AREA WHILE THIS EQUIPMENT IS IN ENABLED.** Observe all safety regulations covering the use & operation of this equipment. It is the responsibility of the employer to identify hazards and ensure all safety requirements are met and that all personnel are trained in safe operation of equipment. This document does not cover all hazards or all areas of operation.

Operator input is achieved through manipulating the operators control panel switches, pushbuttons, and touch screen. Before operating the system a thorough check of the equipment must be made to ensure all areas of operation are clear of personnel and obstructions. Only authorized, safety trained personnel should be allowed to operate or access the equipment. A key switch is provided to limit unauthorized use of the equipment, it is the employer's responsibility to control this key and limit access to the start key only to authorized, and safety trained personnel.

This is not a guide for best mill operating practice, merely a description of how to operate the controlled functions on a function by function basis.

Study the operator panel layout below to become familiar with terms used in these instructions.

- 1.3.1 Start PLC control
- 1.3.2 Start motors
- 1.3.3 Stopping loader
- 1.3.4 Turner
- 1.3.5 Cant Leveler
- 1.3.6 Centering
- 1.3.7 Dog carriage
- 1.3.8 Homing setworks
- 1.3.9 Entering set values
- 1.3.10 Running setworks
- 1.3.11 Clearing jams



1.3.1. To start the system:

- a. Thoroughly check all equipment to ensure all areas of operation are clear of personnel and obstructions.
- b. Push the e-stop button
- c. Turn on control power by inserting and turning the start key
- d. Allow the system to start-up, when ready the screen will display a large screen button marked “PLC disabled push here to enable” and the power indicator light will flash indicating an e-stop state in the PLC (Note: the indicator displays the PLC status, not the e-stop button status).



- e. Release the e-stop button, **!WARNING!** releasing the e-stop pushbutton enables output power, this may result in unexpected automatic machine motion. Be sure all areas of operation are clear of personnel and obstructions before releasing the e-stop.
- f. Press the screen pushbutton marked “PLC disabled push here to enable” or turn the start key again to clear the e-stop state in the PLC. **!WARNING!** enabling the PLC (or clearing the PLC e-stop status) may result in unexpected automatic machine motion. Be sure all areas of operation are

clear of personnel and obstructions before enabling the PLC (or clearing the PLC e-stop status).

- g. The system is now powered and enabled for operation.

Note:

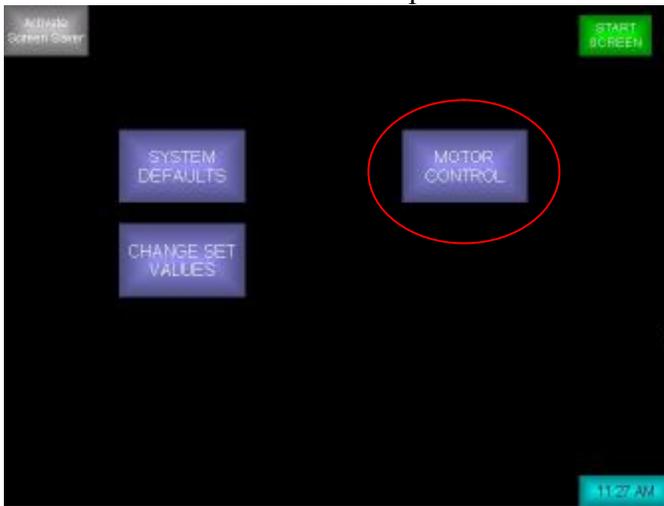
Some operating function & screens will not be available until certain preparatory steps are taken, for example, set positioning moves are not operational until the main HPU is on and the networks are homed.

1.3.2. Start the motors (with system enabled)

- a. Press the menu button (this button becomes visible when the PLC is enabled)



- b. On the menu screen press the Motor Control button



Menu screen

- c. The screen will then change to the motor control screen



Motor Control Screen

- d. Start the hydraulic power units first to provide hydraulic power for control
 - e. Check that all ancillary functions are prepared for operation, i.e. guides, stopping loader, drop belts etc. are in proper position before starting conveyors and band mills.
 - f. Be sure all areas of operation are clear of personnel and obstructions, then start the conveyor motors & the bandmill.
 - g. If a motor is running the indicator between the on and off pushbuttons will flash and the text will change from off to on.
 - h. With the motors running the basic functions covered in sections 1.3.3 to 1.3.7 and networks homing (1.3.8) are now operational. Before performing any positioning sets, however, the networks must be homed.
- 1.3.3. Stopping loader (with system enabled and main HPU on):
- a. The stopping loader is operated directly by means of self centering selector switch on the operator panel.
 - b. To load a log turn the selector switch toward the load position
 - c. To return the loader, turn the selector to the return position.
 - d. The loader can be stopped in any position by releasing the lever
- 1.3.4. Turner (with system enabled and main HPU on):
- a. To raise the turner, pull the turner control joystick to the “turner up” position, the turner will rise.
 - b. To lower the turner, push the turner control joystick to the “turner down” position, the turner will lower.
 - c. To run the turners counter clockwise, push the turner control joystick right, to the “turn right” position, the turners will spin counter clockwise and the log will turn clockwise (right hand) (relative to operator view).
 - d. To run the turners clockwise, push the turner control joystick left, to the “turn left” position, the turners will spin clockwise and the log will turn counter clockwise (left hand) (relative to operator view).

1.3.5. Cant Leveler (with system enabled and main HPU on):

- a. To raise the cant levelers, push the level & center joystick left, the levelers will rise and remain raised even with only momentary action of the joystick.
- b. To lower the cant levelers, push the level & center joystick right, the levelers will lower and remain down even with only momentary action of the joystick.

Note:

Levelers will drop in the event of a power interruption, e-stop, or control shut down.

1.3.6. Centering (with system enabled and air pressure supplied):

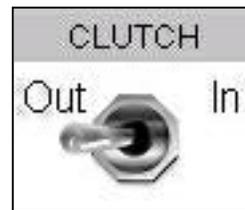
- a. To center a short log (1st and 2nd centering arms only), push the level & center joystick lever up to the “center short log” position. The centering arms will close on the log/cant so long as the joystick is held in position, when the lever is released the arms will return to the open position.
- b. To center a long log (1st and 3rd centering arms only), pull the level & center joystick lever down to the “center long log” position. The centering arms will close on the log/cant so long as the joystick is held in position, when the lever is released the arms will return to the open position.

1.3.7. Dog carriage (with system enabled, main HPU on, carriage HPU on, air pressure supplied, and networks homed).

Note:

Dog carriage moves by 2 methods, the main “sharp” chain drive system and by a separate “carriage return” motor. A mechanical dogging clutch locks the carriage in time with the sharp chain drive for forward movement (toward outfeed end) and backward movement (toward infeed) controlled by the feed lever (by others). This is used when sawing and when returning a cant to be re-sawn or turned & squared, etc. When returning an empty carriage, while running a cant out to the outfeed, the clutch is disengaged and a the return motor is utilized to return the carriage to the infeed end.

- a. To engage/ disengage the clutch manually, on the networks run screen press the clutch toggle to alternate. The clutch cannot be manually disengaged if a log/cant is dogged. The clutch cannot be manually engaged if the carriage is on a travel limit switch. This toggle shows the actual state of the clutch not the commanded state.



- b. If on a limit switch, the clutch automatically disengages and the brake is applied, to override the limit switch and move the carriage off the switch, press the “limit override” button on the networks run screen, then move the carriage off the limit switch.



- c. Dogging, to dog a cant or log press the Dog/undog button on the feed control lever. This button has an alternating action, if the

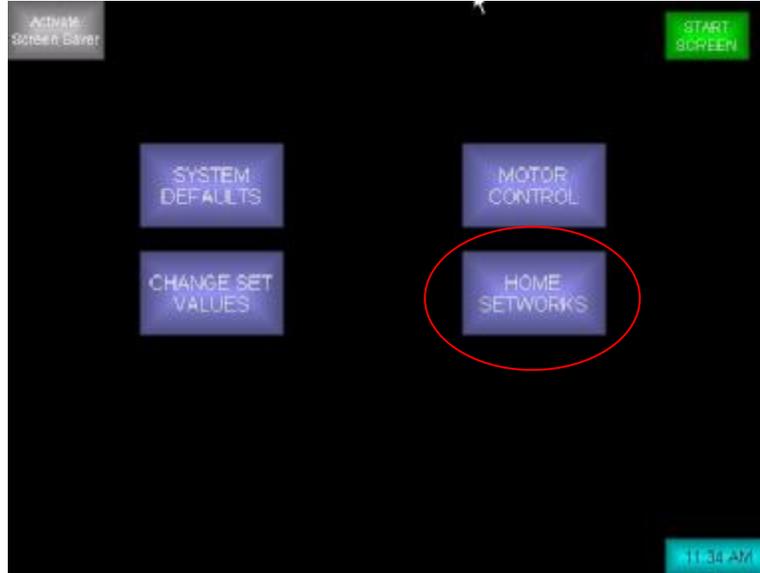
dogs are up pressing the button will drop the dogs, if they are down, pressing the button will raise the dogs. Dogging (or lowering the dogs) also causes the carriage brake to be released (if engaged) and the drive clutch to be engaged. Undogging (or raising the dogs) does not necessarily disengage the clutch, it will be under manual control and will conform to the conditions of 1.3.7.a above.

- d. Brake application is entirely automatic; the brake will be applied under certain conditions and only for a timed period. Certain functions, such as the return motor, may be delayed while the system is braking. Other timers control the sequencing of events as well; refer to the adjustments section for more information on timing.
- e. For carriage return “manual” (by return motor, not by sharp chain drive), press the carriage return mode toggle (on setworks run screen) to switch between auto and manual return modes. Press the panel pushbutton marked “carriage return”, the clutch will be disengaged and the return motor will be turned on so long as the button is held down, and so long as the carriage is not on a travel limit switch.
- f. For carriage return “automatic” (by return motor, not by sharp chain drive), press the carriage return mode toggle (on setworks run screen) to switch between auto and manual return modes. Press the panel pushbutton marked “carriage return”, the clutch will be disengaged and the return motor will be turned on until the carriage is trips the infeed end travel limit switch. Then refer to 1.3.7.b for moving off the limit switch.

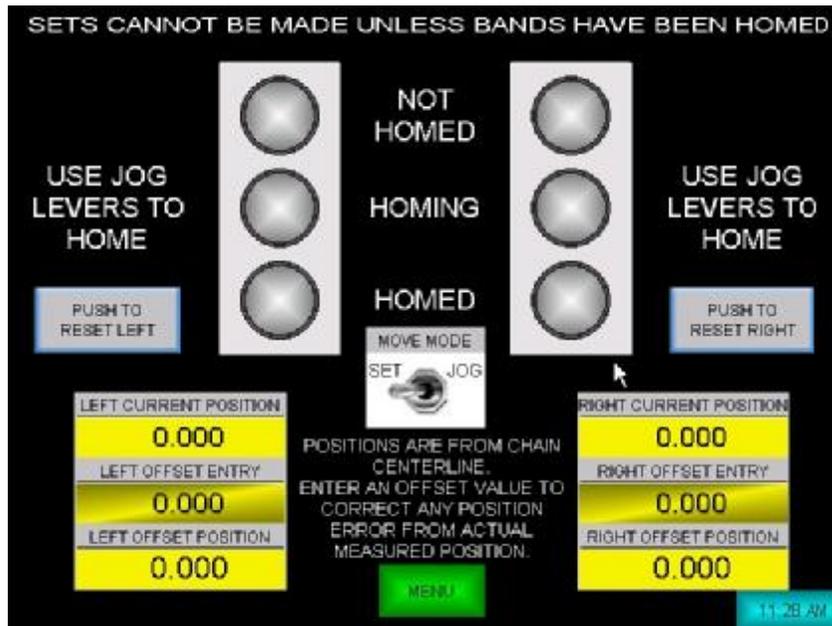


1.3.8. Home networks (with system enabled and main HPU on):

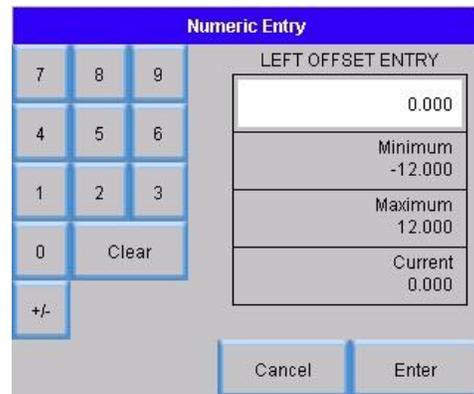
- a. Press the Menu button to return to the menu screen, with the main hpu running and the networks NOT homed; the menu screen will appear as shown below.



- b. Press the home networks button to change to the home networks screen as shown below (the home networks button is only visible when the main HPU is running)

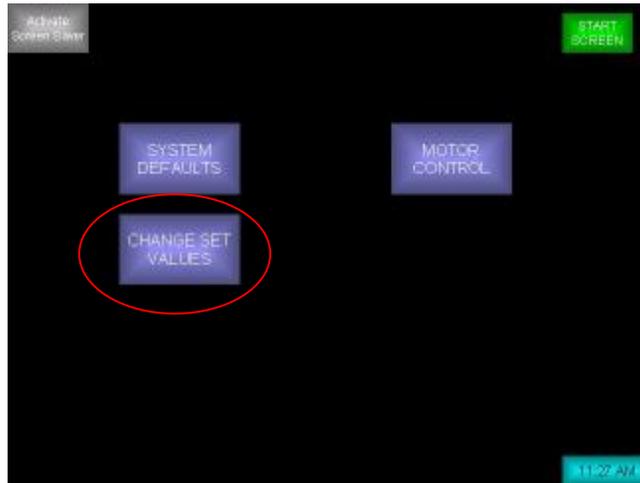


- c. Press the move mode toggle button to change between set mode and jog mode, if the machine was recently started or reset you will need to toggle this button from set to jog mode to re-activate the jog mode.
- d. Jog each bandmill axis back & forth using the panel selector switches until the spotlight turns green, indicating that the axis has passed over the homing index position and the position counter is reset. If the light is red the axis is not homed, if the yellow light flashes, the control is sending a jog command (homing), if the yellow light is flashing and the axis is not moving try reversing direction, if the yellow light flashes in the other direction, but the axis still doesn't move, there is a problem with the set controller or cabling.
- e. If for any reason you wish to clear the homed status of either side, press the reset left or right screen buttons on the homing screen.
- f. Each bandmill position is displayed, this value, in inches, is the distance from the *centerline of the sharp chain to the cut surface of the cant*. It does not include the kerf. Any error between the displayed value and the actual measured value can be eliminated by entering the error amount in the offset entry window. Touch the offset entry display and a numeric entry window will open, enter the +/- offset value with the keypad & press enter when done. The value you enter will be added to the current position and the result is displayed as the offset position. If you enter a negative number it will “add” a negative value to the current position which is the equivalent of subtracting the same value. The screen is divided left & right for each bandmill, both must be homed in order to make set moves.

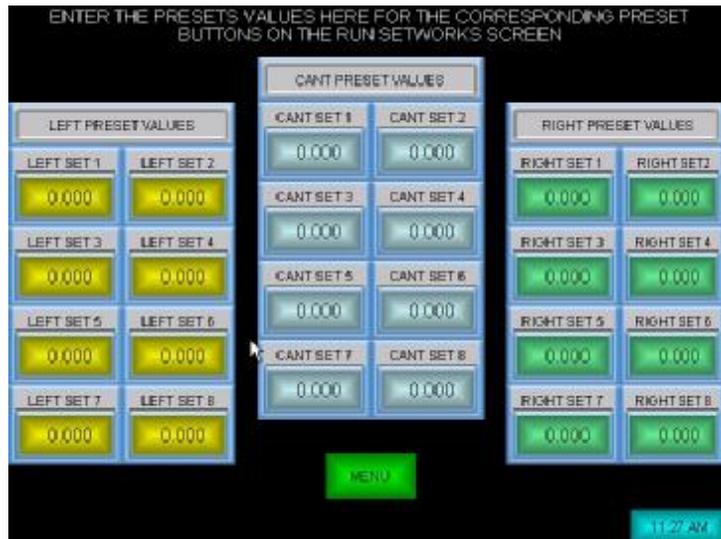


1.3.9. Enter set values (system enabled)

- a. From the menu press the “change set values” button. This will change the screen to the preset entry screen.

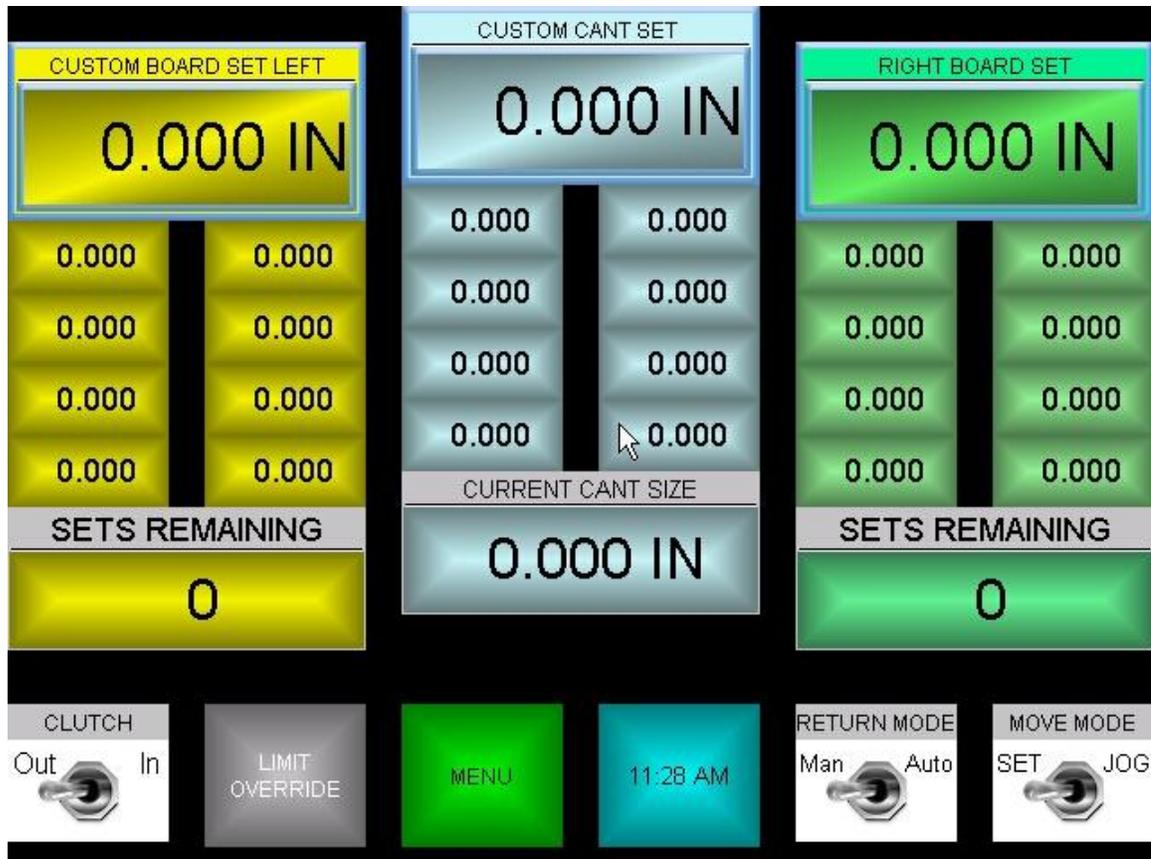


- b. On the preset entry screen an array of values are displayed for left board sets, right board sets, and cant sets. Each preset here corresponds to a button on the networks run screen, touch any preset button to change its value and a numeric entry window will open. Only positive values from 0-12” are allowed. The values entered will be retained even when the system is shut down and re-started. Enter common board and cant set values here, odd or custom values can be entered on-the-fly in the run networks screen. Do not add kerf to these values, only enter the dimension in inches of the finish board or cant desired, kerf is automatically accounted for. The kerf value is entered in the defaults screen, see the adjustments section.



1.3.10. Running networks (with system enabled, main HPU on):

- c. From the menu press the “Run networks” button. This will change the screen to the Run networks screen. This is the screen used for normal operation.



- d. This screen displays a large amount of information, familiarize yourself with this screen before attempting operation. The key information provided on this screen is the following:
 - i. The left and right board set values and the center cant set value are displayed at the top of each preset array. These are multi-function displays, they display the currently active board/cant set value and also if you touch the display, a numeric entry window will open allowing a custom value to be entered without having to return to the preset entry screen.
 - ii. The preset arrays correspond to the values entered in the “change set values” screen. Eight common presets are provided for each of left board, right board and cant (center). These preset buttons allow one touch entry of the value displayed into the currently active set. Simply push on a preset and the value will be entered as the current set.

- iii. Sets remaining left and right. Because it is possible to jog left and right asymmetrically and it is also possible to make different size set moves left and right a display is provided to inform the operator of how many more sets can be made at the current set value. This display also automatically compensates for when the bands have been backed off $\frac{1}{4}$ " to return a cant, and for kerf, it will not display an inaccurate count. When 0 sets remain on a given side and the cant size is still larger (or smaller) than the cant set size, the next set trigger will move the band to the current cant set size *automatically*, so the operator needn't worry about undercutting his cant size.
 - iv. Current cant size displays a real-time reading of what the current cant size is if cut at the current position.
 - v. Clutch toggle, this manual toggle displays the actual clutch state so if a manual disengage is commanded, but it is overridden by the automatic process, the toggle will show the operator the actual state of the clutch which is important for operation and troubleshooting.
 - vi. Return mode, this toggles the carriage return mode described in 1.3.7.e and f
 - vii. Move mode, this toggles between set (or positioning) moves and jogging moves. The operator may jog the networks to position for the optimum opening face on each side of the log visually with a laser light or other means (by others) to take the first pass, then switch to set mode to take dimensional board or cant sets thereafter.
- e. To make a set move, enter valid values for the board & cant sets, (a 12" board preset can be used to always jump to cant size if not sawing boards). press the set trigger button on the feed lever handle, if the inhibit set limits are not on the bands will move to the next valid set position as determined logically by the control software. No set will be made if already at the current cant set value.
 - f. To back off bands $\frac{1}{4}$ " for returning a cant through the bands to be resawn or squared, press the back off $\frac{1}{4}$ " button on the feed lever handle. The bands will back off $\frac{1}{4}$ " each side, the panel indicator light will light when the move is complete, that is the indication that the bands are backed off. Caution should always be exercised, however, when backing through the bands, if an equipment failure occurs it is possible that the light may come on even if the move was not physically made.

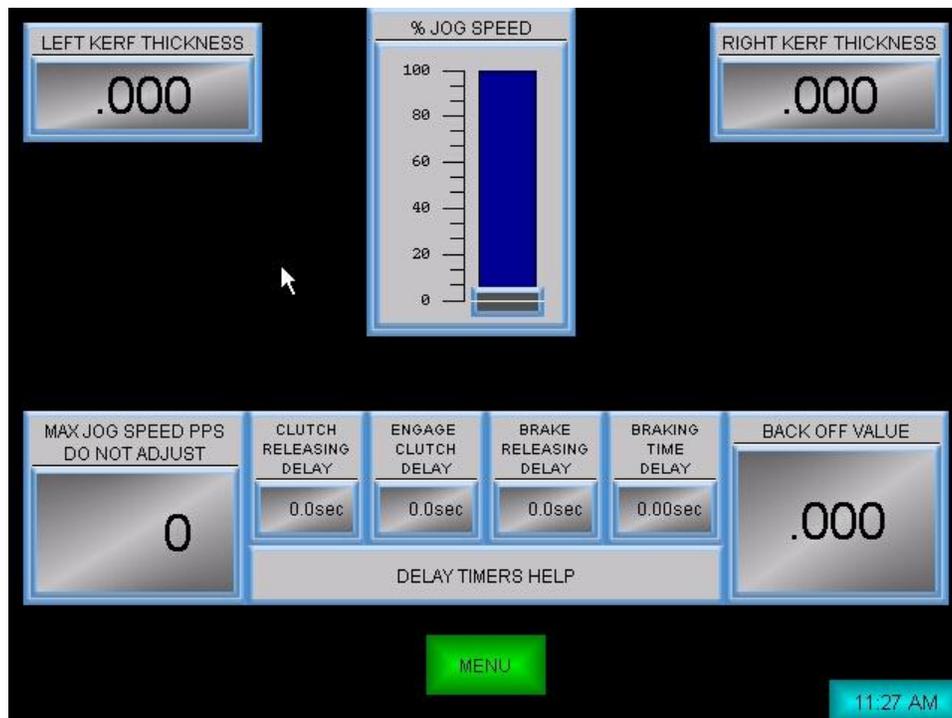
1.3.11. Clearing jams

- A. **DO NOT ATTEMPT TO CLEAR ANY JAM OR REMOVE ANY FOREIGN OBJECTS BY HAND ON LIVE EQUIPMENT, THE EQUIPMENT IS AUTOMATED & MAY OPERATE UNEXPECTEDLY AT ANY TIME CAUSING SEVERE INJURY OR DEATH.**

- b. To clear a jam from the control booth:
 - Only if you have a clear view of the jam, actuate the jammed device in opposite directions (if possible) to dislodge the jam, bear in mind the consequences of your actions, do not perform any actions that may cause debris to be ejected uncontrolled. Flying debris can cause serious injury or death.
- c. If unable to clear the jam from within the control booth, the equipment must be completely shut down, locked out & tagged out and all sources of potential energy released or properly secured per OSHA *and* your plant standards *before* attempting to manually clear the equipment.

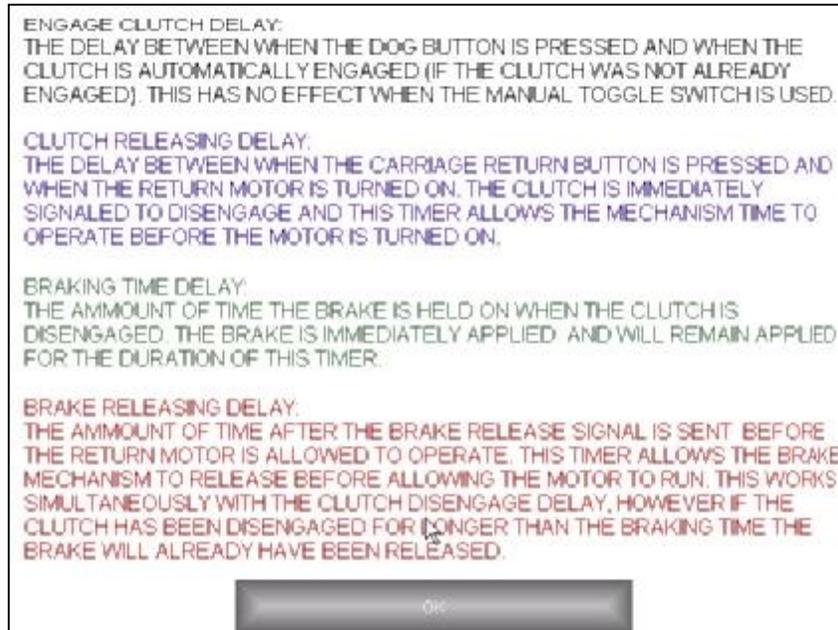
1.4 Adjustment

- 1.4.1. To adjust setpoints of the set controller, please refer to section 1.3.9
- 1.4.2. All limit switches should be adjusted so that they are positively made at the appropriate point in order to ensure reliable operation. Do not set limit switches such that the switch is “teased” or made too early.
- 1.4.3. There are 4 adjustable timers in this system accessible from the “system defaults” screen. A password is required to make adjustments to these timer values and it is not intended for the operator to have access to these adjustments, they are for equipment protection and should be adjusted by qualified maintenance personnel only. Touch the display to open a password entry window, with a valid password entered, a numeric entry window will then open.
- a. The timers are:
 - i. clutch releasing delay
 - ii. engage clutch delay
 - iii. brake releasing delay
 - iv. braking time delay



System
Defaults
Screen

- b. an on-line help page is provided to help clarify the significance of each timer, press the “Delay timers help” button & the following screen is displayed:



- 1.4.4. Many of the hydraulic and pneumatic functions have adjustments for speed located on the directional valve outputs. Please refer to your hydraulic & pneumatic system documentation for specific details concerning your hydraulic & pneumatic system. The Maximum Jog speed of the setworks motion is adjustable in this window; however, in order to protect the equipment, it is factory set & not accessible by the customer.
- 1.4.5. The back off (set) value is adjustable, although normally this will be .250” or ¼” it may be desirable to increase this value if ¼” is not enough clearance. Touch the display to open a numeric entry window.
- 1.4.6. The kerf thickness value left and right can be set to compensate for the saw kerf and may be different from band to band. Touch the display to open a numeric entry window.
- 1.4.7. The jog speed can be adjusted from 0-100% of the maximum speed for operator preference, simply touch the slide scale and drag the slide bar to the desired percentage value, the value is automatically entered when the slide bar is released.
- 1.4.8. The set controller tuning is adjusted by specialized software and will require a service call to make any adjustments. Changing the proportional valves will require re-tuning the set controllers, unless replaced with identical valves.
- 1.4.9. Changes to the PLC and touch screen software should not be made by the customer.

1.5 Drawings

The pages to follow contain the electrical schematic drawing(s):

Drawings contain proprietary information and have been omitted from this on-line example manual

1.6 Manufacturers Cut Sheets

The pages to follow contain manufacturers catalog cut sheets for selected equipment. Manuals for some equipment omitted here are provided on cd-rom.

Catalog cut sheets contain proprietary information and have been omitted from this on-line example manual